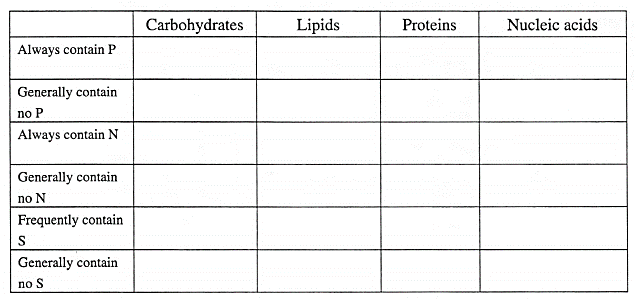
Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_

**Macromolecules: The Final REVIEW!**

Mrs. Krouse, 2015-2016

Identify the elements found in each of the macromolecules by filling in the chart given below.



For each of the functional groups listed in the chart below, name the functional group and place a checkmark in the appropriate column to indicate the macromolecules in which that functional group is found.

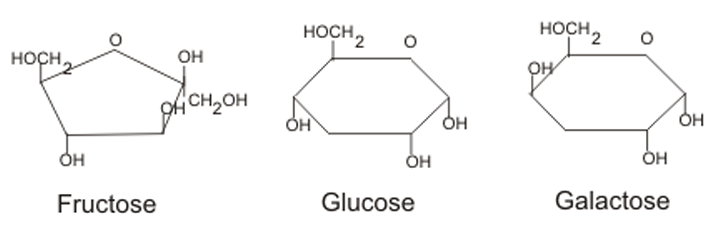
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Functional Group | Name | Carbohydrates | Lipids | Proteins | Nucleic Acids |
| -OH |  |  |  |  |  |
| -C=O |  |  |  |  |  |
| -SH |  |  |  |  |  |
| -COOH |  |  |  |  |  |
| -NH2 |  |  |  |  |  |
| -PO42- |  |  |  |  |  |

Use the information given in the “Identifying Macromolecules Tutorial” below to help you identify each image in the chart afterwards as either a carbohydrate, lipid, protein, or nucleic acid and either a monomer or polymer.

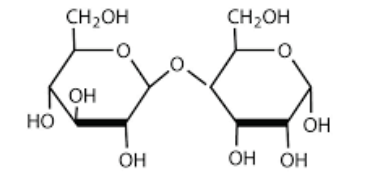
**Identifying Macromolecules Tutorial**

***Carbohydrates***

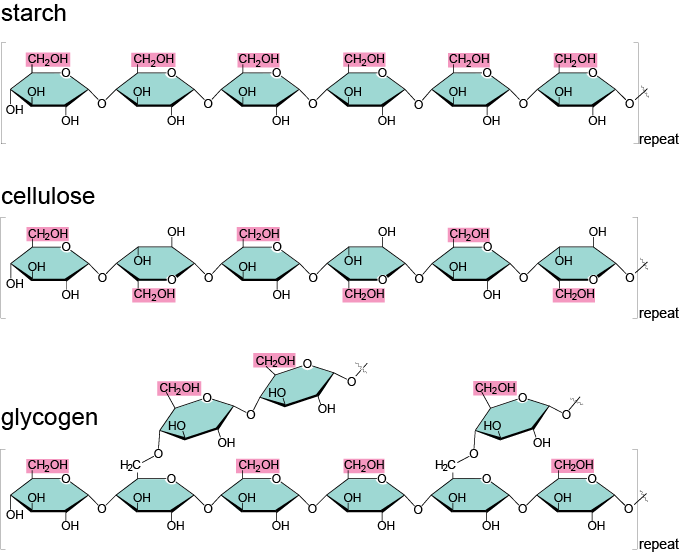
* Pictures of carbohydrate monomers (monosaccharides) have one ring of carbon atoms (looks like a pentagon or hexagon) with oxygen atoms and hydrogen atoms branching off the ring. (Remember: the basic chemical formula for a carbohydrate is C1H2O1 ). Monosaccharides may also be shown as a chain (rather than a ring) of carbon atoms (not pictured here).



* Pictures of carbohydrate dimers (disaccharides) have two rings of carbon atoms joined together by bonds

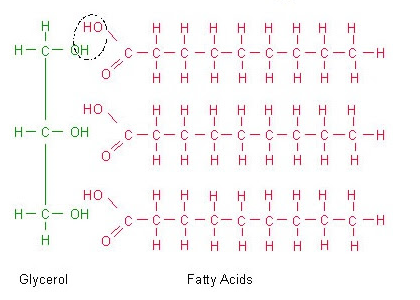


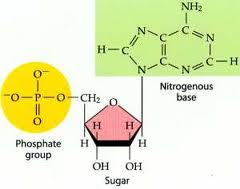
* Pictures of carbohydrate polymers (polysaccharides) have several rings of carbon atoms joined together by bonds.



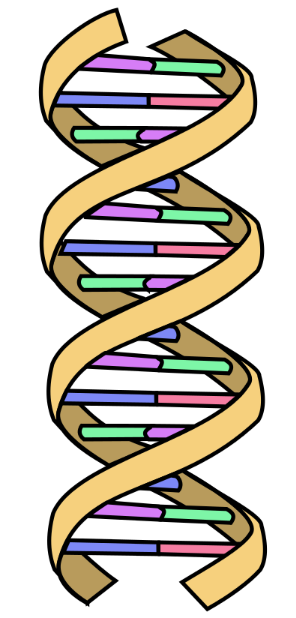
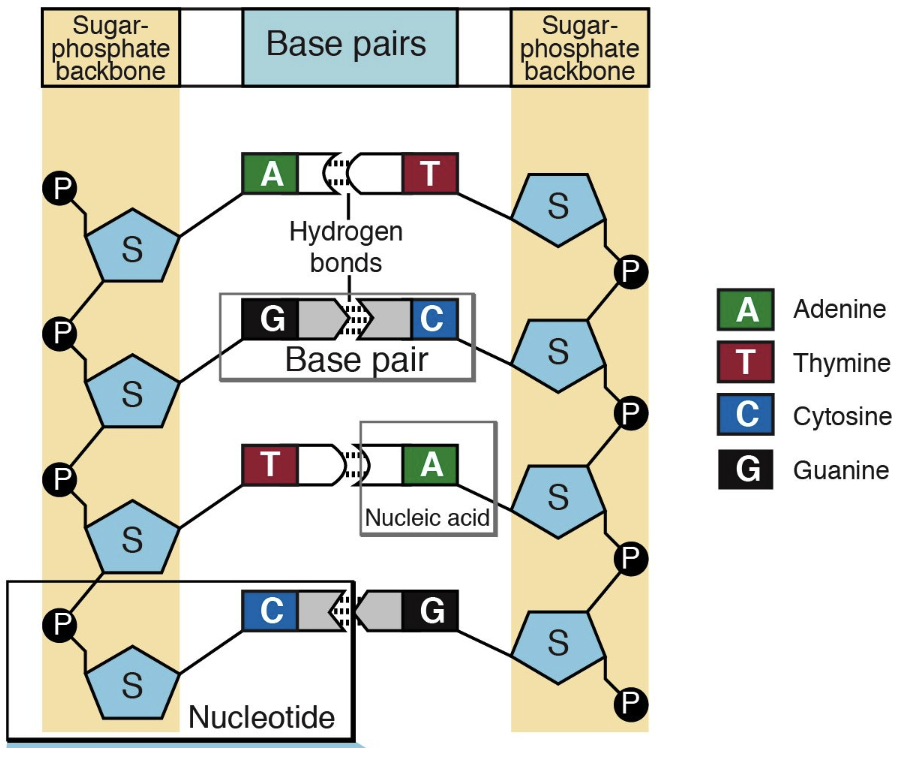
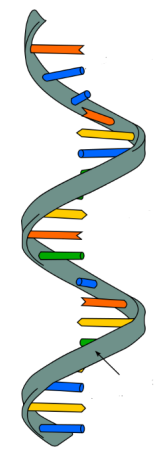
***Lipids***

* Pictures of lipid polymers (fats) have a glycerol molecule (three carbon atoms joined in a chain with oxygen and hydrogen atoms branching off) linked to one or more fatty acid molecules (long chains of carbon and hydrogen atoms)



***[](http://www.google.com/url?sa=i&rct=j&q=&esrc=s&frm=1&source=images&cd=&cad=rja&uact=8&docid=84EAmbRzZc0jpM&tbnid=N8dD6qTVGl7LpM:&ved=0CAcQjRw&url=http://biochemicalminds.wordpress.com/2014/04/06/finding-neverlandnucleotides-nucleic-acids-and-nucleosides/&ei=PGAtVLKzBJO4ggTouID4Bw&bvm=bv.76477589,d.cWc&psig=AFQjCNGC_-HeCg5QlFpakOT6J036IGa6nA&ust=1412346221269830)Nucleic Acids***

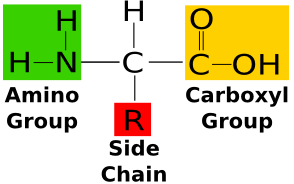
* Pictures of nucleic acid monomers (nucleotides) have a phosphate group (with a phosphorus atom surrounded by four oxygen atoms, PO42-), a 5-carbon sugar (looks like a pentagon), and a nitrogenous base (looks like one or two rings containing nitrogen atoms
* Pictures of the nucleic acid polymer DNA have a double helix structure (a winding staircase) that is composed of two chains of nucleotides. When “untwisted” the DNA molecule looks like a ladder. The phosphate groups and 5-carbon sugars of each nucleotide are located in the sides of the ladder, and the nitrogen bases form the middle “rungs” of the ladder.



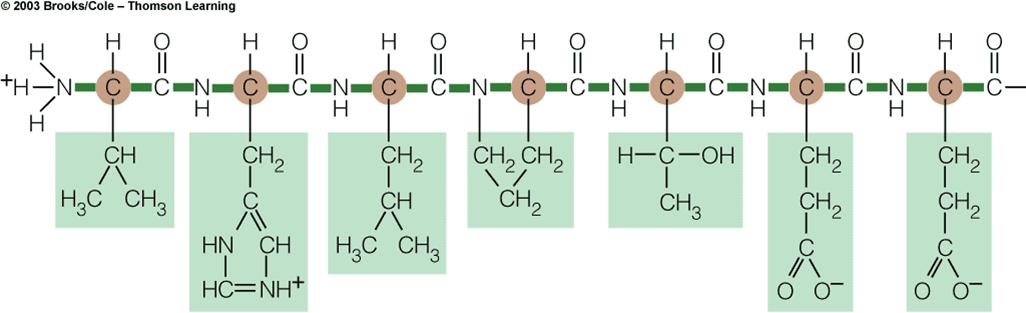
* Pictures of the nucleic acid polymer RNA show a single chain of nucleotides with the nitrogen bases “sticking out” from the chain.

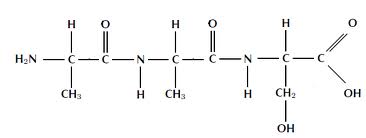
***Proteins***

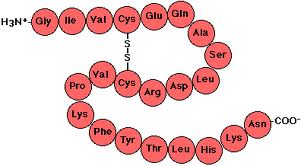
* Pictures of protein monomers (amino acids) have a central carbon atom bonded to four things: a single hydrogen atom, an amino group (contains nitrogen and hydrogen atoms), a carboxyl group (contains a carbon atom that is double-bonded to an oxygen atom), and an R group (changes for each of the 20 different amino acids)



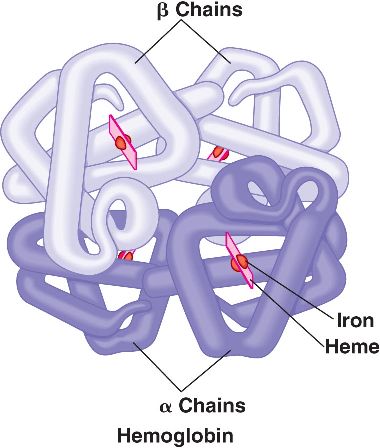
* Pictures of protein polymers (polypeptide) show a chain of amino acids, with the amino group of one amino acid bonded to the carboxyl group of the next amino acid in the chain (see next page for image).



[](http://www.google.com/url?sa=i&rct=j&q=&esrc=s&frm=1&source=images&cd=&cad=rja&uact=8&docid=IlyjuuIyjX3vqM&tbnid=pJbiThBjzbOaCM:&ved=0CAcQjRw&url=http://qatemplates.everythingscience.co.za/grade-12/02-organic-macromolecules/02-organic-macromolecules-06.cnxmlplus&ei=AGItVPS2HNTAggS-goLoDg&bvm=bv.76477589,d.cWc&psig=AFQjCNEj9LEOmztS2PN03R4pcYRyX1OZXA&ust=1412346739785315)

[](http://www.google.com/url?sa=i&rct=j&q=&esrc=s&frm=1&source=images&cd=&cad=rja&uact=8&docid=PPWd10L6b6SNfM&tbnid=CSmm7J6UIWERMM:&ved=0CAcQjRw&url=http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/P/Polypeptides.html&ei=PGItVNu5Fc_PggS2o4HoAw&bvm=bv.76477589,d.cWc&psig=AFQjCNEj9LEOmztS2PN03R4pcYRyX1OZXA&ust=1412346739785315)

* Pictures of a “full protein” may show multiple polypeptide chains folded around one another.



**Identifying Macromolecules Chart**

*Note: #’s 1 and 2 have been completed for you as examples.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **Image** | **Carbohydrate, Lipid, Protein, or Nucleic Acid?** | **Explanation** | **Monomer or Polymer?** |
| 1 |  | Lipid | This is a fatty acid chain (all C’s and H’s) bonded to a glycerol molecule | Polymer |
| 2 |  | Protein | This is an amino acid because it has a central carbon atom bonded to four things… a hydrogen atom, a carboxyl group (COOH), an amino group (NH2), and an R group | Monomer |
| 3 | http://ww1.prweb.com/prfiles/2011/12/01/9006172/adenine-nucleotide.jpg |  |  |  |
| 4 | http://www.chemeddl.org/resources/models360/files/107526/d-glucose-beta%20Haworth.png |  |  |  |
| 5 | http://web.visionlearning.com/custom/chemistry/custom/images/starch_yellow2.gif |  |  |  |
| 6 |  |  |  |  |
| 7 |  |  |  |  |
| **#** | **Image** | **Carbohydrate, Lipid, Protein, or Nucleic Acid?** | **Explanation** | **Monomer or Polymer?** |
| 8 |  |  |  |  |
| 9 |  |  |  |  |
| 10 |  |  |  |  |
| 11 |  |  |  |  |